

**B.E. PRINTING ENGINEERING FOURTH YEAR SECOND SEMESTER
SUPPLEMENTARY EXAM 2023**

DIGITAL IMAGE PROCESSING

Full Marks – 100

Time: 3hr

Please read the instructions carefully and make sure answers of each COs are given separately in one place. You can use any matrix of your choice from the question to demonstrate any algorithm.

CO 1: Describe the underlying concepts different digital image processing operations (K2)

Answer any 1 question (1 x 25)

1. a) Describe the different path concepts of digital image with suitable examples. 12
- b) Describe the dilation and erosion operations of digital image processing with suitable examples. Also state few examples of applications of these concepts. 11 + 2
2. a) Describe the histogram equalization process with suitable example. 12
- b) Describe the concept of high-pass, low-pass and band-pass filtering in frequency domain. 13

CO2: Apply the concept and algorithms of digital image processing in given image (K3)

Answer any 1 question (1 x 25)

3. a) Apply VLC algorithm on the following image and show the amount compression could be achieved.

15

80	98	54	75	40	54	75	98
98	98	98	80	23	54	80	40
40	40	80	80	25	80	40	65
98	98	98	54	80	80	75	40
75	98	75	75	75	30	75	80
30	50	30	30	40	50	30	40
40	80	80	75	98	50	30	65
65	30	98	30	30	75	65	75

[Turn over

b) Apply median and mean filtering to the given image and state your observations on the resulted images.

198	254	180
175	45	175
230	230	240

10

4. a) Apply adaptive global thresholding to the following image to separate in two segments. 10

60	200	120	70	120	70
70	100	200	150	150	200
190	120	70	120	150	200
190	200	120	70	150	200
70	190	70	150	120	200
70	200	200	70	150	200

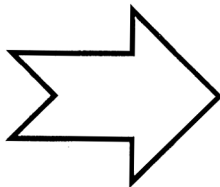
b) Apply unsharp masking on the following image and state your observations on the resulted image. 15

52	98	150
55	73	180
40	87	180

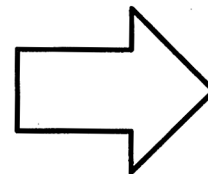
CO3: Analyze the requirement of probable image processing operation(s) for given goals (K4)

Answer any 1 question (1 x 25)

5. a) Analyze the following 2 shapes using chain code and state the degree of similarity. Consider same number of nodes for both the shapes. 20

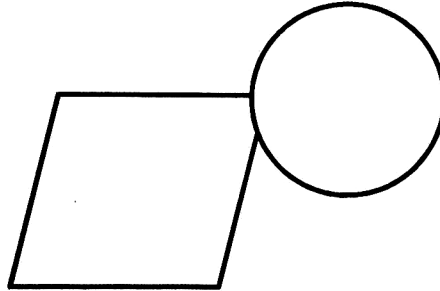


Shape 1



Shape 2

b) Analyze the following image and state the suitable image processing operation may be used to separate these two shapes. 5



6. a) Analyze the following two histograms. Which is low contrast image and why? If the low-contrast image is needed to be improved following the histogram given in Fig. 3 which process may be used and why? 10

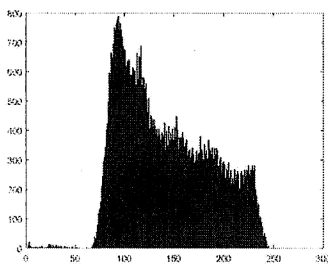


Fig. 1

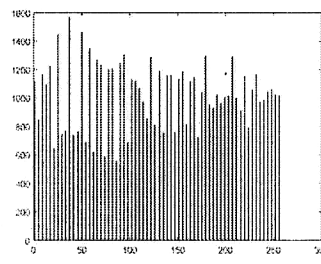


Fig. 2

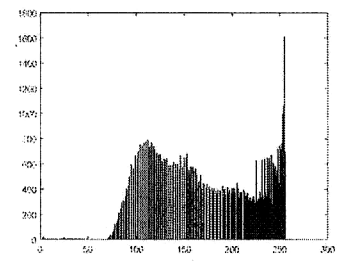


Fig. 3

b) Analyze the following requirements and suggest the suitable digital image processing algorithms with justifications. 15

- i) In an X-ray image the regions of fractures to be separated from the entire bone regions.
- ii) The characters of an scanned image are joined to each other and need to be separated for OCR.
- iii) A binary image has about 5000 rows. We need to compress it.

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CO 4: Explain the performance of digital image processing operations in the light of different image evaluation measures (K5)

Answer any 1 question (1 x 25)

7. Consider the following two images and i) calculate their discrete entropy and ii) AMBE between them.

25

60	140	200
60	140	200
70	160	255

Image 1

80	200	230
98	240	210
75	88	156

Image 2

8. Consider the following two images and calculate their structural similarity using suitable metric. 25

60	140	200
60	140	200
70	160	255

Image 1

80	200	230
98	240	210
75	88	156

Image 2

XXXXXXXXXXXXXXXXXXXXXXXXXX